

## **Jackknife Style Convertible Bed With Storage Compartment Support**

### **Claim of Priority**

**[0001]** This application claims priority on Provisional Application Serial No. 60/430,566 filed December 3, 2002, having the same title as this invention.

### **Background of the invention**

**[0002]** The invention is a convertible sofa bed for recreational vehicles having a storage compartment under the seat bottom. Access to the storage compartment is provided by raising the seat bottom. The seat bottom is supported by a ratcheting mechanism enabling the seat bottom to be raised to a storage access position, and raised again to unlock and then lowered to a seating position, this motion being accomplished without the use of a separate release for a dead bolt type lock.

### **Description of Related Art**

**[0003]** Preexisting "Jackknife Hinge Assemblies" have a pair of arms connected by a crossbar or link, however, the lock bracket and related assembly is absent, and the swing bracket (38) is absent. Instead of the configuration of the current invention in which back hinge (36) and seat hinge (42) each connecting through the swing bracket (38), in the older designs the equivalents of the back and seat hinges connect directly to one another.

**[0004]** On early Jackknife sofas, the left and right linkages were kept in time with one another by the seat frame. In addition the seat frame acted as a stop "lock" in both a seating and bed position. Upon development of newer linkages a timing bar performs these functions. The timing bar also acts as a stop to hold

the linkage and back frame while the seat is rotated up to access the storage area.

There is also a helper spring.

**[0005]** A patent on a Jackknife bed mechanism is United States Patent 6,082,805 issued to Gray, et al. July 4, 2000 entitled "Multi-purpose recreational vehicle seat having storage compartment access".

**[0006]** A lock design using a butterfly ratchet is used on fold-out sofa sleeper couch mechanisms to hold the head of the bed unit in a "TV" position. An example is US Patent No. 4,253,205 issued to Mikos on March 3, 1981 entitled "Sofa-sleeper." This has a "TV slotted link 200" co-acting with "TV support link 208" operatively supported by the movement of "butterfly member 218."

#### **Brief Description of the Drawings**

**[0007]** Fig. 1 is a top plan view of a convertible sofa sleeper in the seating position.

**[0008]** Fig. 2 is a front elevational view of a convertible sofa sleeper in the seating position.

**[0009]** Fig. 3. is a side elevational view of the mechanism for a convertible sofa sleeper in the seating position.

**[00010]** Fig. 4 is a side elevational view of the convertible sofa sleeper in the seating position.

**[00011]** Fig. 5 is a side elevational view of the mechanism for a convertible sofa sleeper in the storage access position.

**[00012]** Fig. 6 is a side elevational view of the convertible sofa sleeper in the bed position.

**[00013]** Fig. 7 is a front elevational view of the mechanism for a convertible sofa sleeper in the seating position.

**[00014]** Fig. 8 is a top plan view of the mechanism for a convertible sofa sleeper in the seating position.

#### **Detailed Description of the Preferred Embodiment**

**[00015]** A seat (10) for a recreational vehicle is convertible between a sofa position and a bed position. The seat (16) is mounted on a frame support (30). Frame (12) defines a storage area thereunder. Frame (12) could be metal legs with appropriate walls or a wooden structure. The mechanism (14) interconnects the seat bottom (16) and back (18) so that bottom (16) pivots to provide access to the storage area. Seat bottom (16) is lifted at its front (20) and when lifted to a selected height, is maintained in a raised position by support (24). Handle (22) attaches to the bottom of the timing bar (28).

**[00016]** The side frame (30) has a rear swing link (32) and a front swing link (34) pivotally attached thereto at the lower ends of the respective links. At the upper end of rear swing link (32) is attached back hinge (36). The pivot to back hinge (36) is approximately in the middle of back hinge (36). The bottom end of back hinge (36) is pivotally connected to swing bracket (38) at the top, rear of swing bracket (38). The top, front of swing bracket (38) connects to the top of front swing link (34). The mechanisms may be mirror images of one another on the left and right sides, respectively. The description here applies to either side.

**[00017]** It will be noted that each swing bracket (38) has an inwardly turning flange which respective flanges have timing bar (28) bolted thereto. In this

manner, motion imparted by handle (22) is directly transmitted to the respective swing bracket (38) on each side of the piece of furniture, thus assisting in the complex motion of the linkage shifting from a seating to a bed position.

**[00018]** The middle of rear swing link (32) and a front swing link (34) are interconnected by swing tie link (40). At the top, middle of swing bracket (38), seat hinge (42) is pivotally connected. Finally at the bottom of swing bracket (38) is pivotally connected lock bracket (44) at the rear end of lock bracket (44).

**[00019]** In shifting from a seating position (Fig. 4) to a bed position (Fig. 6), as the handle (22) of seat (10) is lifted, the entire mechanism (14) raises on the bottom pivots (62) of the front and rear links. The seat bottom (16) raises at its front and is fixed relative to the swing bracket (38) because of the lock. Thus, the seat bottom (16), seat hinge (42) and swing bracket (38) all pivot around the swing bracket pivot. The entire mechanism (14) moves forward and down, the front of the seat bottom moves down, and the seat back pivots around its pivot on the swing bracket to a bed position.

**[00020]** In the storage access operation, the seat bottom (16) is movable between a seat position (Fig. 4) and an open position (Fig. 5). The lock (50), or support feature is used to hold the seat up for storage access. A ratcheting lock tab (46) is riveted through the slot (52) in the lock bracket (44) and into the seat hinge (42). Said lock tab (46) is formed with two “V” shaped notches at opposite ends to form a “butterfly” shape.

**[00021]** When the seat is lifted up, the lock tab (46) rides along the slot (52). When lock tab (46) reaches the end (54) of the slot (52), the lock tab (46) hits a

small lance (56) causing it to rotate about 45°. Lance (56) could be formed by stamping or pressing the sheet metal, or could be formed as a separate piece, such as a pin. The element can be referred to generically as a stop member, incorporating the lance, pin or other equivalents. As the seat (16) is lowered slightly the lock tab (46) catches on the lock guide (58) on the lock bracket locking the seat in an up position. The guide (58) could be formed separately and riveted or could be formed by stamping or pressing in sheet metal. It has also been found advantageous to add an e-ring behind the tab (46) to keep it from dragging and turning on bracket (44) as it moves in slot (52).

**[00022]** Rotation is permitted by clearance for tab (46) provided when rivet (60) is formed. When the operator lifts up on the seat again, the lock tab (46) hits the (56) again causing the lock tab (46) to rotate another 135° to straighten it out; thus allowing the seat to pivot back to a seating position.

**[00023]** The handle assembly (22) attaches to the bottom of the timing bar (38) with two bolts on each end. This handle assembly running side to side keeps the right and left linkages in time with one another. The rod handle part of the handle assembly (22) comes to rest "stop" at both extremes of the linkage cycle to lock the sofa in either a bed or sitting position.

**[00024]** Lock bracket (44) and travel of the lock tab (46) in the slot (52) limits the upward travel of the seat frame. The mechanism opens to an angle of roughly fifteen to thirty degrees from the vertical. The angular relationship between the raised seat and the seat back is between about 45 and as much as 60 degrees.

**[00025]** The interaction of lock bracket (44), ratcheting lock tab (46), rivet, slot (52), lance (56) and lock guide (58) on the bracket can sometimes be referred to as a "ratcheting support." This ratcheting support is distinguished from such alternatives as a rotating plate lock which operates by pins engaging and disengaging selected notches in the plate, this latter arrangement sometimes referred to as a dead bolt type lock, because of the action of the pins in the notches.

**[00026]** As can be seen in the drawings, and particularly in Fig. 3, the seat hinge (42) is a generally triangular shape, with its base being parallel to the frame for the seat bottom. The swing bracket (38) is a tetragon of generally trapezoidal shape, oriented with its narrow side down, much like a 'keystone' shape. The back hinge (36) is a tetragon, of generally deltoid shape, with one side parallel to the frame for the seat back. It will be understood that the exposed apexes of these shapes are typically rounded, without departing from the general relationship of the sides. The geometry of these components optimizes pivot location, motion and strength.

**[00027]** As will be understood by one of ordinary skill, the seat bottom and seat back will support cushions. The geometry of the linkage also provides advantages in the clearance between the open seat bottom and back in that the seat bottom is not permitted to travel closer than about 60 degrees from the angle of the seat back, thereby enabling opening and locking without crushing the cushions